

REMARKS/ARGUMENTS

Claims 1-3, 5, 7, 8 and 10-13 are pending herein. Claims 5 and 7 have been withdrawn from further consideration by the PTO. Claims 1 and 8 have been amended as supported by original claim 9, Figs. 1-4, Examples 1 and 2 and paragraphs [0009], [0011], [0018], [0023], [0030] and [0031], in the specification, for example. Claim 9 has been cancelled without prejudice or disclaimer. Claims 10 and 11 have been added as supported by paragraph [0007] in the specification, for example. Claims 12 and 13 have been added as supported by original claims 2 and 3, respectively. Applicants respectfully submit that no new matter has been added.

Claims 1-3 and 9 were rejected under §103(a) over Yara alone or further in view of Hartmann or Awazu; and claims 1-3, 8 and 9 were rejected under §103(a) over Yara in view of Mizuno. To the extent that these rejections may be applied against the amended claims, they are respectfully traversed.

Claim 1 has been amended to clarify that the atmosphere consists of a carbon source gas and a dilution gas containing at least one group VIII element of the Periodic Table, that the pulse voltage is an impulse voltage, the opposing electrodes are not covered with a solid dielectric material and the thin film comprises diamond like carbon that is not a crystalline diamond like carbon. Claim 8 has been amended in a similar manner.

Yara discloses a method for producing thin carbon films at low temperature by setting a solid dielectric along an opposing plane of counter electrodes and creating a plasma by applying a pulsed electric field between the counter electrodes and an atmosphere containing carbon and oxygen and/or hydrogen under a pressure near atmospheric pressure. The PTO relies upon Hartmann and Awazu for disclosing DLC thin films having a Raman spectrum allegedly near the claimed wave number values.

The PTO relies upon Mizuno for allegedly disclosing an ultra short pulse to charge plasma for forming DLC thin films under low or vacuum pressure conditions.

Amended independent claims 1 and 8 are distinguishable from the cited references for at least the following reasons.

First, Yara discloses utilizing impulse type pulse voltages of 1 to 1000 μsec to produce crystalline diamond like carbon (Yara paragraph [0052], [0054] and Fig. 2). Yara expressly excludes pulse durations of less than 1 μsec (1000 nsec) because the plasma discharge would be unstable (Yara paragraph [0025]). Both Yara and Hartmann disclose producing crystalline diamond like carbon. Mizuno does not disclose forming any film. Therefore, combining Yara with Hartmann, Awazu or Mizuno, as suggested by the PTO, would have led skilled artisans to predict the formation of crystalline diamond like carbon. In contrast, independent claims 1 and 8 now clearly claim that the diamond like carbon film is not a crystalline diamond like carbon and has a Raman spectrum comprising a mean peak about a wave number of 1580cm^{-1} and a shoulder peak in a wave number range of 1300 cm^{-1} to 1500 cm^{-1} .

Second, a vacuum discharge process disclosed by Mizuno is used to produce a thin film under a high vacuum atmosphere and would not generate a discharge plasma when used under near atmospheric pressure as used in the process disclosed by Yara for the reasons discussed in the Amendment filed January 29, 2008, the entirety of which is incorporated herein by reference.

Third, Yara discloses that at least one electrode is covered by a solid dielectric material (claim 1). Further, Yara specifically discloses that if at least one electrode is not covered with a solid dielectric material, an arc discharge is generated between the electrodes (paragraph [0016]). Mizuno also discloses that a portion of each electrode is covered by a ceramic insulator (dielectric material) (page 657). In contrast, amended claims 1 and 8 clearly recite that the opposing electrodes are not covered

with a solid dielectric material. Hartmann and Awazu fail to overcome the deficiencies of Yara. Thus, the claimed opposing electrodes are structurally distinct from the cited references.

Further, a combination of the claimed nanosecond impulse voltage and the opposing electrodes that are not covered with a solid dielectric covering material, all of which are both contrary to the disclosure of Yara, help avoid the arc discharge and the unstable discharge disclosed by Yara. Further, the absence of this solid dielectric covering material helps the flow of ion current between the opposing electrodes so that an amorphous diamond like carbon having considerably different Raman peak values than those of Yara's crystalline diamond like carbon are formed.

Fourth, the process disclosed by Yara requires at least one of oxygen and hydrogen in the atmosphere for the formation of the crystalline DLC film (Yara claim 1, paragraphs [0008], [0036] and [0040]). In contrast, the atmosphere of amended claims 1 and 8 consists of a carbon source gas and a dilution gas containing at least one group VIII element of the Periodic Table. Mizuno, Hartmann and Awazu fail to overcome the deficiencies of Yara. Thus, the claimed atmosphere is physically distinct from the atmosphere of Yara.

Based on the above, the cited references fail to teach or suggest each and every element of amended claims 1 and 8. Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw these rejections.

For at least the foregoing reasons, Applicants respectfully submit that all pending claims herein are in condition for allowance. Accordingly, the Examiner is requested to issue a Notice of Allowance for this application in due course.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

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Date



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